

Scope of Work on the development of requirements for updates of interoperability standards applicable to  
Distribution and Transmission Operations in the Smart Grid environment.

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**Table 1. General Assessment**

Activity 1		Activity 1-1		Activity 1-2		Activity 1-3		Activity 1-4		Comments
Title	Status	Title	Status	Title	Status	Title	Status	Title	Status	
Develop Use Cases for Distribution Grid Management <sup>1</sup>	<b>Done</b> in PAP 8 of TnD DEWG for three major DMS applications	Define messages for interfaces defined in the use cases <sup>2</sup>	<b>Done</b> in PAP 8 of TnD DEWG	Categorize messages by standards.	<b>Done</b> in PAP 8 of TnD DEWG and submitted to IEC	Define gaps (missing object models and/or missing attributes of existing object models)		Define needs for harmonization of overlapping standards		About 10% of the messages are not identified
Develop Use Cases for DMS support of the information exchange between DMS and EMS (TBLM)- Draft 1	In progress, ~80% done <sup>3</sup>	Review Draft 1 of the TBLM use cases (by the TnD DEWG)	In progress							

<sup>1</sup> SG-use cases for DGMIv3, <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PAP08DistrObjMultispeak>

<sup>2</sup> PAP\_8\_DGM\_Information\_Exchange\_Categorization\_v3 , <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PAP08DistrObjMultispeak>

<sup>3</sup> Development of Transmission Bus Load Model (TBLM), Use cases for DMS support of information exchange between DMS and EMS, [https://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/TnD/TBLMUseCase\\_V12a-08-29-12.pdf](https://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/TnD/TBLMUseCase_V12a-08-29-12.pdf)

Develop a mature version of the Use Cases for the TBLM	TBD	Define messages for interfaces defined in the use cases	TBD	Categorize messages by standards.	TBD	Define gaps	TBD	Define needs for harmonization of overlapping standards	TBD	
Develop use cases for the upgrade of EMS applications (see Table 2)	TBD	Define messages for interfaces defined in the use cases	TBD	Categorize messages by standards.	TBD	Define gaps	TBD	Define needs for harmonization of overlapping standards	TBD	
Develop use cases for DMS applications executing EMS requests through the TBLM (see table 3)	TBD	Define messages for interfaces defined in the use cases	TBD	Categorize messages by standards.	TBD	Define gaps	TBD	Define needs for harmonization of overlapping standards	TBD	

**Table 2. Tentative List of Use Cases on Operations of the Transmission/Sub-transmission and Generation Systems with Integration of the Information Exchange between the Distribution and Transmission Management Systems (a.k.a Transmission Bus Load Model -TBLM).**

#	Function	Comments
1	Wide Area Situational Awareness/Transmission model update	To represent the current and short-term look-ahead states and resources of distribution operations

2	Contingency analyses with preventive actions	To account for reaction of distribution operations to contingencies in the T&G systems and to derive preventive actions including distribution components:
2.1	Steady-state contingency analysis	<ul style="list-style-type: none"> <li>E.g., to take into account the reactions of DER to short-term and long-term deviations of voltage (ride-through) and to derive preventive measures to mitigate the harmful results of the contingency and the adverse reactions</li> </ul>
2.2	Voltage stability contingency analysis	<ul style="list-style-type: none"> <li>E.g., to take into account the reaction of DER to shortage of reactive power and to derive preventive measures to mitigate the harmful results of the contingency and the adverse reactions</li> </ul>
2.3	Frequency and/or voltage deviation analysis (island situations)	<ul style="list-style-type: none"> <li>E.g., to take into account the reaction of DER to significant changes of frequency and voltages, and to derive preventive measures to mitigate the harmful results of the contingency and the adverse reactions, including adaptive pre-settings of remedial action schemes.</li> </ul>
2.4	Angle stability analysis	<ul style="list-style-type: none"> <li>E.g., to take into account the reaction of DER to significant swings of voltages and angles (frequency)</li> </ul>
3	Emergency operations (within feasible time window)	To use the opportunities of distribution operations for mitigating transmission emergencies
3.1	Unloading overloaded facilities	<ul style="list-style-type: none"> <li>E.g., enabling rapid demand response, storage discharge, DER commitment</li> </ul>
3.2	Providing volt/var support in cases of harmful voltage violations in transmission	<ul style="list-style-type: none"> <li>E.g., changing the generation/demand of reactive power in distribution.</li> </ul>

3.3	Restoration actions after emergency	<ul style="list-style-type: none"> <li>E.g., prioritization of restoration based on the TBLM updated for the post-emergency situation in distribution (TBLM presents the amount and relevant attributes of the shed load, enabled DR, disconnected DER, abnormal connectivity and volt/var setups)</li> </ul>
4	Unit commitment	<ul style="list-style-type: none"> <li>E.g., to involve VPP in operational planning</li> </ul>
5	Economic Dispatch or equivalent function	<ul style="list-style-type: none"> <li>E.g., to involve VPP in near-real-time operations</li> </ul>
6	Optimal Power Flow	To involve available resources in distribution
6.1	- Minimization of losses	<ul style="list-style-type: none"> <li>E.g., to request a change in distribution VVO</li> </ul>
6.2	- Congestion management	<ul style="list-style-type: none"> <li>E.g., to request a change in distribution VVWO</li> </ul>
6.3	- Reduction of Locational Marginal Prices (LMP)	<ul style="list-style-type: none"> <li>E.g., to request reallocation of loads between transmission busses</li> </ul>

**Table 3. Tentative List of Use Cases on Operations of the Distribution System Executing the EMS requests through the Information Exchange between the Distribution and Transmission Management Systems (a.k.a Transmission Bus Load Model -TBLM).**

#	Function	Comments
1	Situational Awareness on distribution operations including EMS requests through TBLM	Update of Distribution Operation Model and Analysis (DOMA) by the change of the components of the objective function and constraints.
2	Adaptation of load shedding schemes based on DER, DR, and ES statuses and EMS requests	To minimize loss of DER generation in case of load shedding by feeders and to meet the EMS load shedding requirements

3	Adaptation of the objective function and constraints of the IVVO in distribution based on EMS requests for transmission volt/var support	May include changes of modes of operations and settings of DER volt/var control capabilities and EPS volt/var controlling devices
4	Adaptation of the objective function and constraints of the IVVWO in distribution based on EMS requests for support of congestion management	May include changes of modes of operations and settings of DER volt/var control capabilities and EPS volt/var controlling devices, as well as enabling Demand Response (DR)
5	Feeder reconfiguration based on EMS request for unloading a particular transmission facility (load swap)	Includes the change of the objective function and constraints of the MFR function, as well as the needs in information on the overloaded elements (current measurements, sensitivity factors, etc.).
6	Feeder reconfiguration based on EMS request for reduction of LMPs at particular buses (load swap)	Includes the change of the objective function and constraints, as well as needs in information on the LMP-to-load sensitivity factors for the involved buses
7	Defining priorities and timing of restoration actions after emergency	Includes re-synchronization of DER, restoration of shed/reduced load, return to normal configuration and volt/var operations
8	Commitment of distribution system resources in response to the EMS unit commitment request	May include management of DG, ES, DR, as well as adjustment of IVVWO
9	Adaptation of distribution system resources in response to the EMS economic dispatch request	May include short-term control of DG, ES, DR, as well as adjustment of IVVWO
10	Adaptation of distribution system resources in response to the EMS OPF request	May include short-term control of reactive power of DG, ES, as well as adjustment of IVVWO, depending on the relationships between the economics of transmission and distribution/customer domains.